Abstract ID: 90

Title: GEOPHYSICAL SIGNATURES OF CU-AU PORPHYRY AND EPITHERMAL AU DEPOSITS

Student: No

Topic: Economic Geology

Medium: Invited Oral Presentation

Author 1 (CONTACT AUTHOR)
Name: Terry Hoschke
Org: Newmont Mining Corporation
Country: Australia

Keywords: geophysics porphyry copper gold epithermal

Abstract: Geophysical data from a number of porphyry and epithermal deposits have been evaluated to determine the physical characteristics of the mineralisation and associated alteration. This paper presents the results of work on a number of deposits including the Batu Hijau, Grasberg and Alumbrera porphyries and the Martabe and Pajingo epithermal deposits.

Mineralisation in porphyry Cu-Au deposits is often associated with magnetite that can produce strong discrete magnetic anomalies. This is usually within a zone of magnetite destructive alteration that can be identified with a high resolution magnetic survey. Magnetic surveys are also useful in defining regional structure and geology. Strong chargeabilities due to sulphides are typically associated with porphyry systems. Mineralisation and clay-pyrite alteration can produce strong anomalies and late stage and post-mineral intrusions can be mapped as chargeability lows within the system. These systems may be more conductive than the host rocks because of clay-pyrite alteration and sulphide veining and airborne EM can be useful in locating and defining the extent of these systems. Gravity, radiometrics, remote sensing and topography may also be useful in exploration for porphyry Cu-Au deposits.

Alteration in high sulphidation epithermal deposits is magnetite destructive over a large area although it does not appear to have a large vertical extent as the subdued character of the underlying lithologies can be observed. Massive silica alteration associated with gold mineralization has resistivities in the order of thousands of ohm-meters compared with a background of argillic and prophylitic alteration with restivities of tens of ohm-meters. Both ground resistivity and airborne EM surveys have been successful in locating and defining these deposits.

Typically low sulphidation epithermal deposits are thin veins that are associated with major structures. The alteration associated with the veins is magnetite destructive and high resolution magnetics can be a very useful and cost effective technique. Some deposits are associated with broad zones of magnetite destruction which is apparent in the regional magnetics. The mineralised quartz veins are within broader zones of silicification and resistivity surveying can be used to map these zones. Generally the high resistivity zones due to silicification are coincident with the structures identified in the magnetics.

High resolution magnetics and electrical surveys are the most useful geophysical techniques in exploration for porphyry and epithermal deposits. Airborne magnetic and EM surveys are fast and cost effective particularly in areas of rugged topography. Regional magnetics, gravity, remote sensed data and topographic data can also be used to identify major structures, intrusive complexes and alteration. Radiometric surveys can be used to map geology and alteration.